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(71) Applicants

**Mitsuba Electric Manufacturing Co Ltd**

(Incorporated in Japan)

**2681, Hirosawacho 1-Chome, Kiryu-shi, Gumma-ken,  
Japan**

**Honda Giken Kogyo Kabushiki Kaisha**

(Incorporated in Japan)

**1-go, 1-ban, Minami-Aoyama 2-chome, Minato-ku,  
Tokyo, Japan**

(72) Inventors

**Akiro Takayama  
Ryu Ikezawa**

(51) INT CL<sup>5</sup>

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INT CL<sup>4</sup> B60S**

(74) Agent and/or Address for Service

**Haseltine Lake & Co  
Hazlitt House, 28 Southampton Buildings,  
Chancery Lane, London, WC2A 1AT, United Kingdom**

**(54) Support for windscreen wiper mechanism**

(57) A support 10 for a windscreen wiper drive and transmission mechanism comprising wiper motor 12, reduction unit 14, linkage 20, and wiper arm drive shafts 16, 17 is provided with legs 26, 27 having grommets 30, 31 with holes 28, 29 for mounting on pins on the vehicle body and also with portions 36, 37 having holes 38, 39 for securing to the vehicle body. In modifications, a U-shaped grommet having a keyhole slot along one side may be used instead of an annular grommet. The mounting pin on the vehicle body may have a threaded end onto which a unit may be fastened.

**Fig. 2**

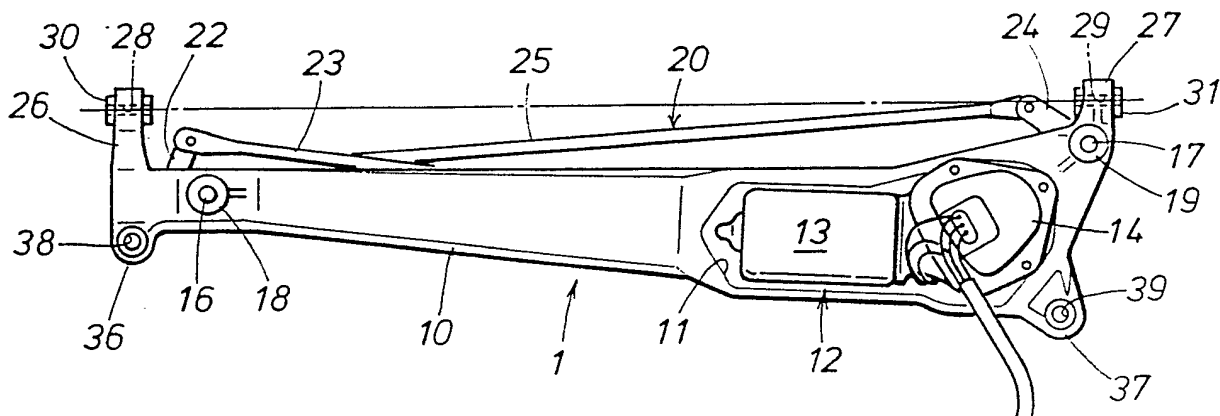


Fig. 1

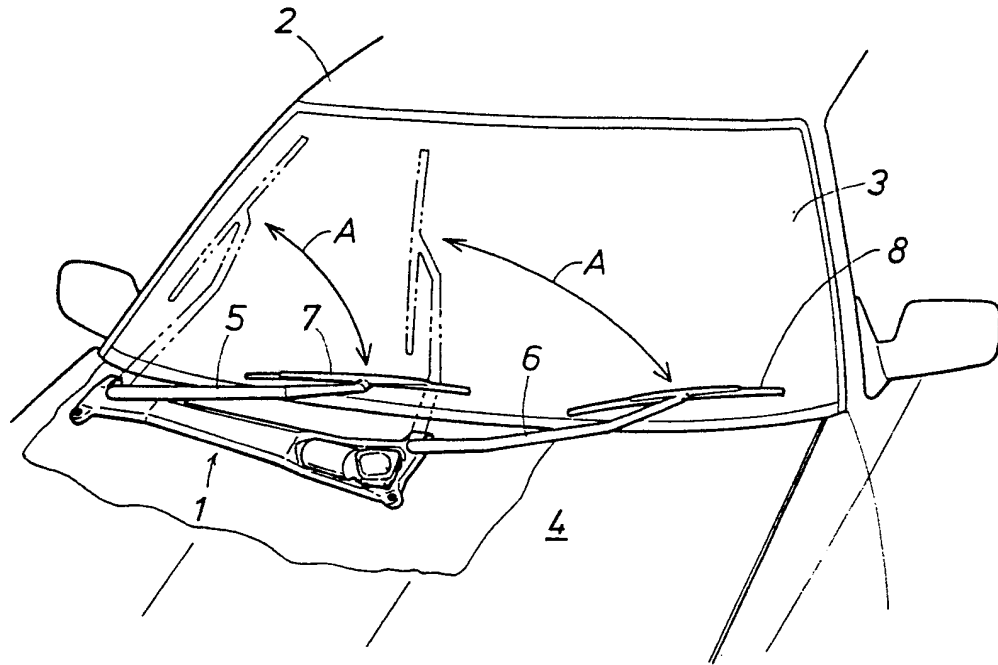


Fig. 2

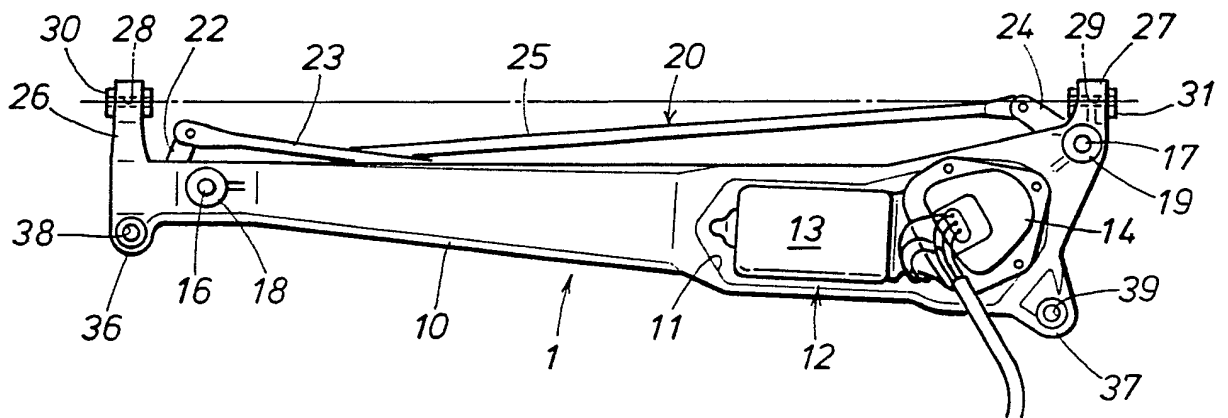


Fig. 3

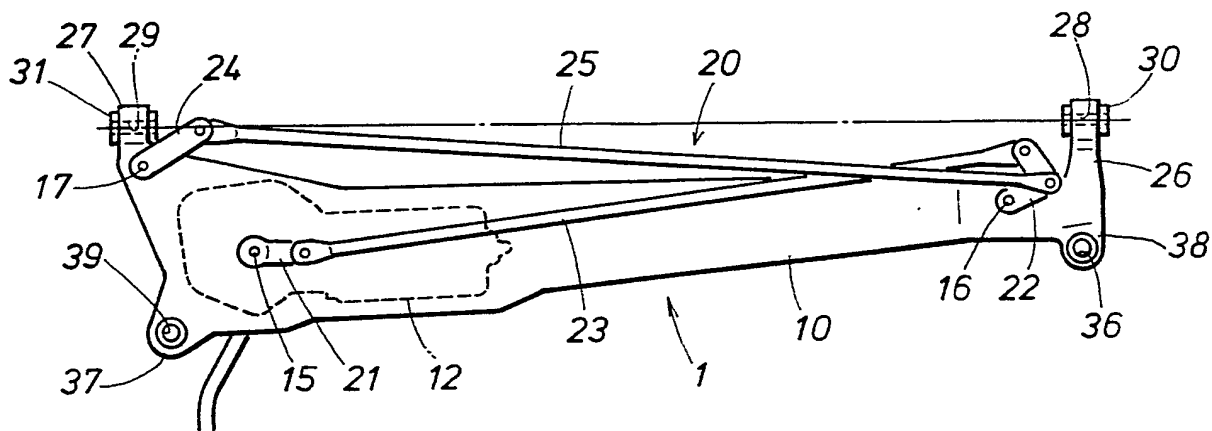


Fig. 4

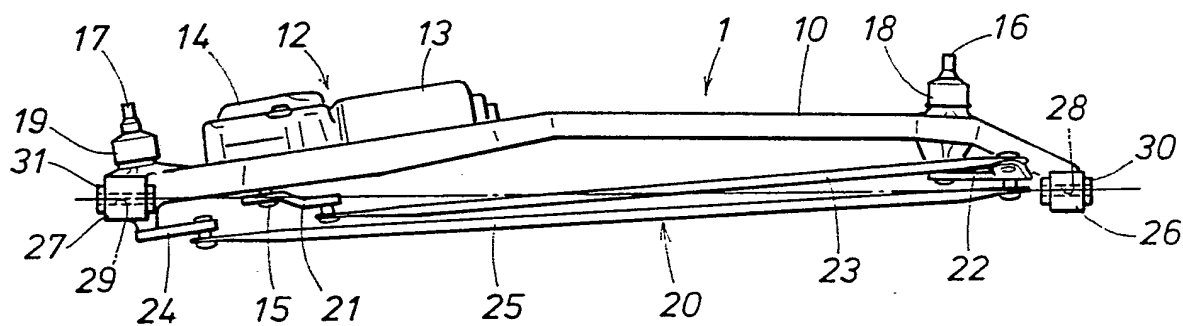


Fig. 5

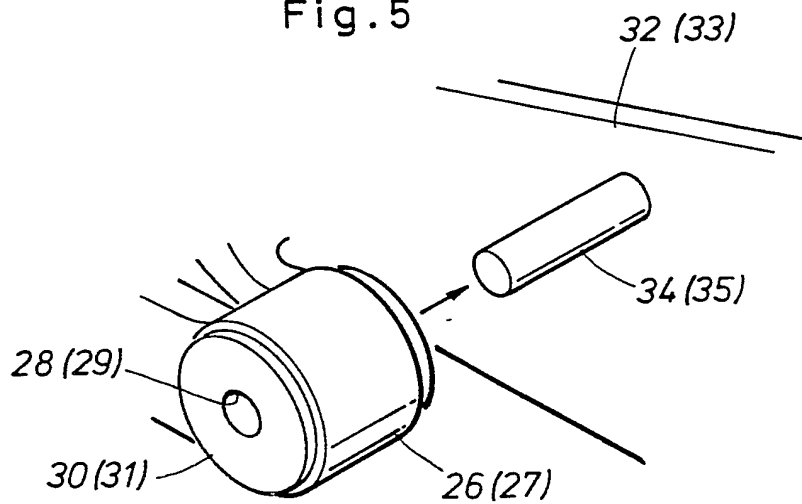


Fig. 6

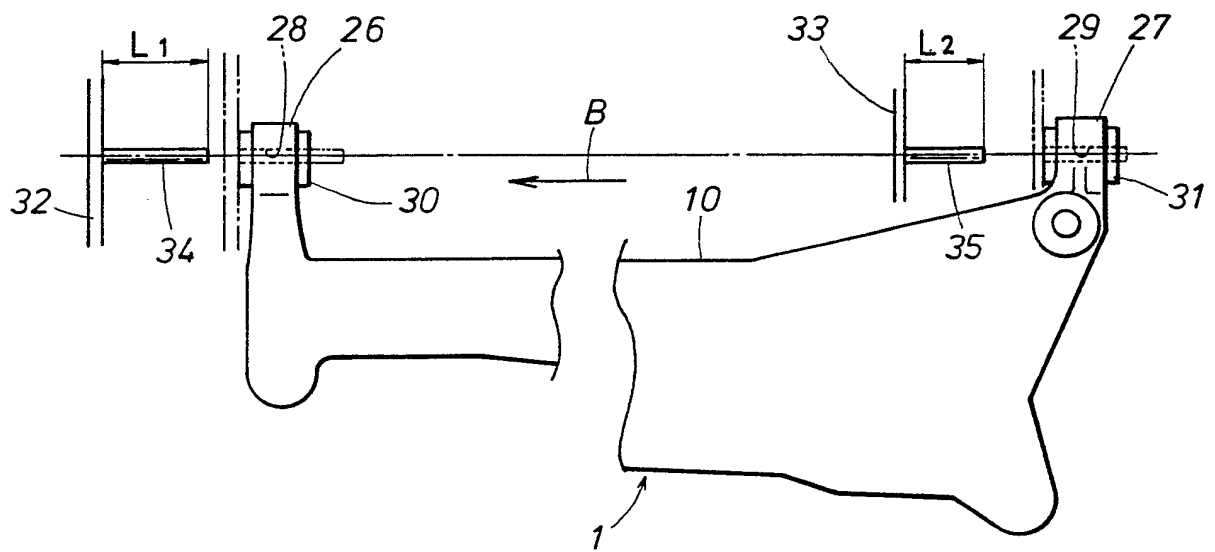


Fig. 7

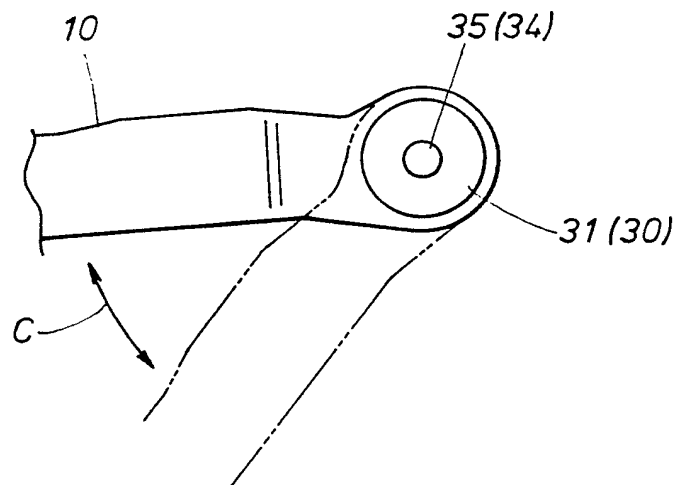


Fig. 8

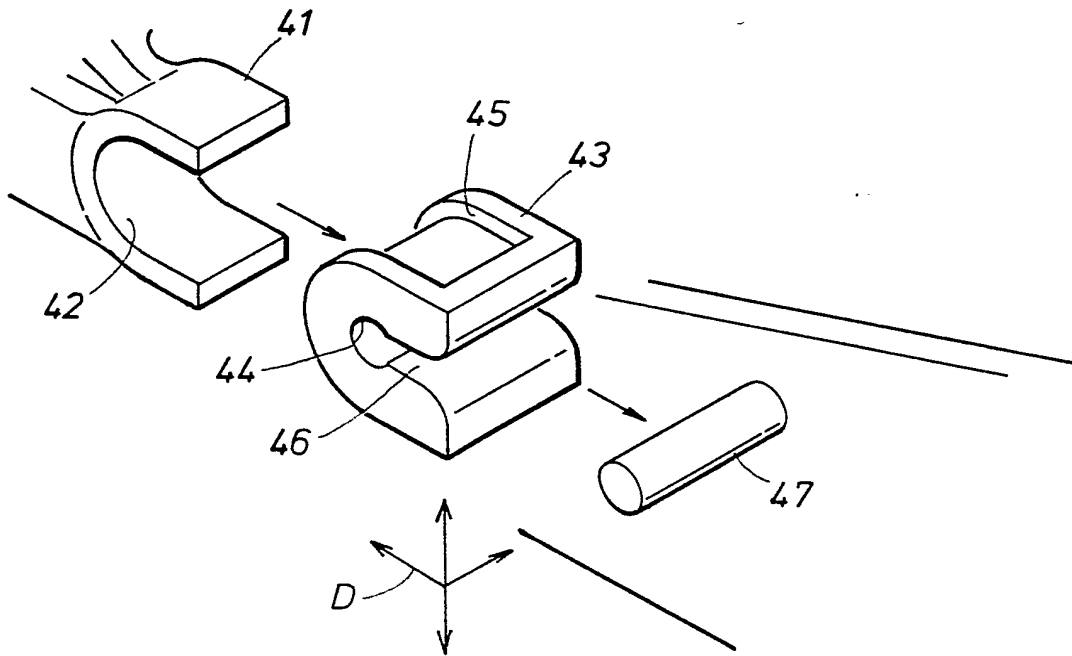
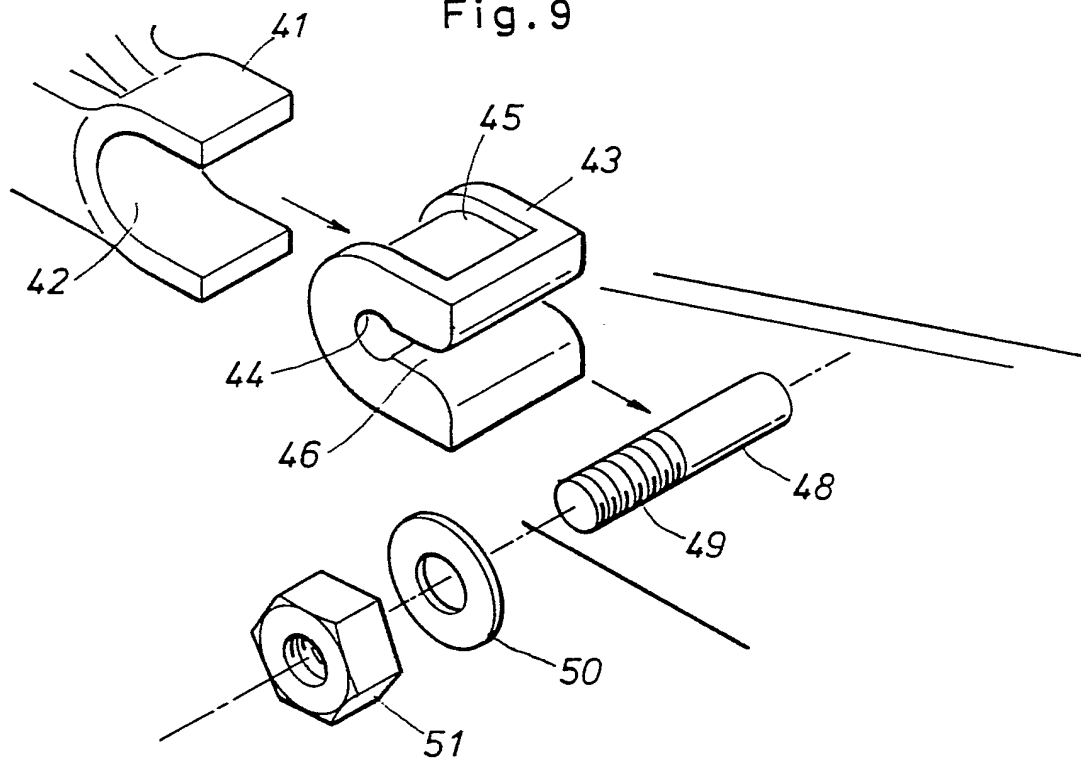


Fig. 9



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Fig.10

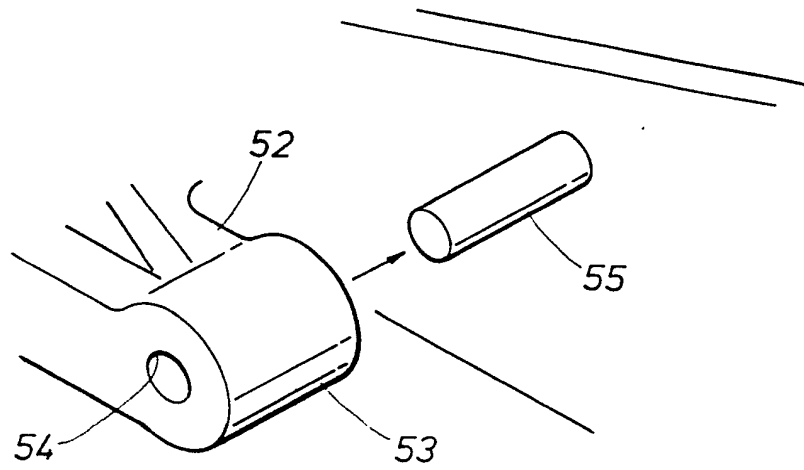
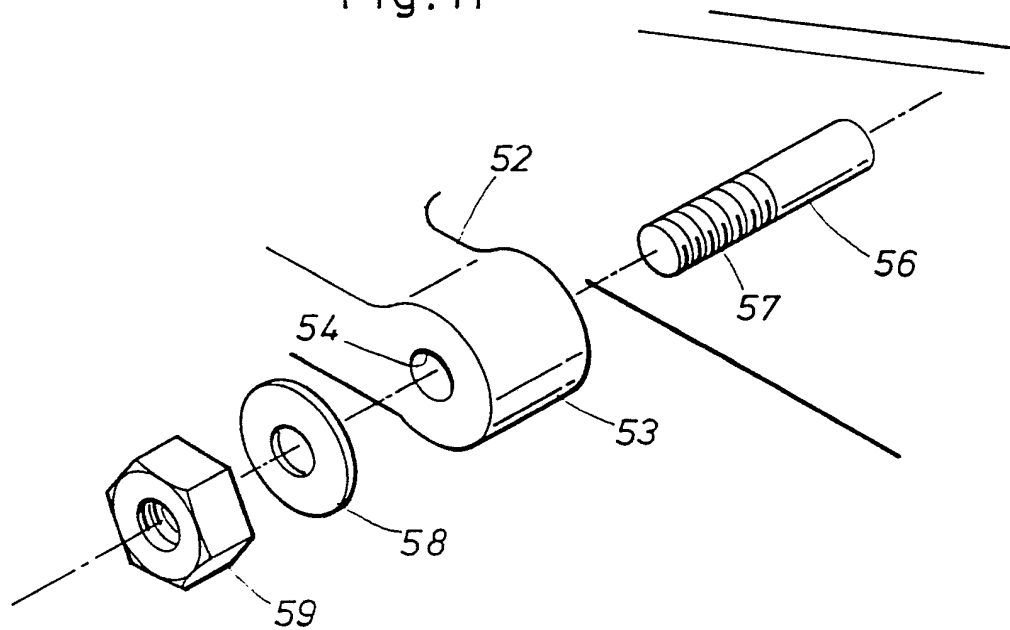


Fig.11



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## MOUNTING STRUCTURE FOR A WINDSHIELD WIPER UNIT

## TECHNICAL FIELD

5 The present invention relates to a windshield wiper unit for wiping the surface of a windshield of a vehicle or the like, and in particular to a mounting structure for a windshield wiper unit which can securely mount a windshield wiper unit on a vehicle body with a minimum amount of effort.

## 10 BACKGROUND OF THE INVENTION

In recent automotive designs, there is a tendency to reduce the size of the cowl panel as a result of an effort to maximize the space of the passenger compartment and preference to extend the windshield more forward than before from an aesthetic view point. Therefore, the mounting space for a motor, a link mechanism, a wiper pivot, etc. making up a windshield wiper unit is extremely cramped, and the mounting seat surface of the vehicle body for the wiper pivot may partly extends to the reverse side of the windshield, thereby causing a considerable drop in the efficiency of the work involved in assembly the windshield wiper unit.

25 Meanwhile, it is necessary to ensure the rigidity of the mounting structure for the windshield wiper unit and achieve a necessary level of dimensional and mounting precision in order to ensure a smooth sweeping movement of the wiper arm and keep up the wiping capability of the windshield wiper unit. Furthermore, lack of mounting rigidity for the wiper pivot and the wiper motor leads to an increase in noise emission due to resonance.

## 30 BRIEF SUMMARY OF THE INVENTION

35 In view of such problems of the prior art, a primary object of the present invention is to provide a windshield wiper unit which can ensure a sufficient

mounting rigidity to keep up its wiping capability and reduce noise emission.

5 A second object of the present invention is to simplify the work involved in mounting a windshield wiper unit on a vehicle body.

10 These and other objects of the present invention can be accomplished by providing a mounting structure for a windshield wiper unit including a subframe for carrying a motor, a pivot shaft to rotatably support a wiper arm at its base end on the subframe, a wiper blade attached to a free end of the wiper arm, and a power transmission mechanism for converting a rotary motion of the motor to a sweeping motion of the wiper arm, the mounting structure comprising: a mounting pin  
15 fixedly secured to one of the subframe and a vehicle body; a mounting hole provided in the other of the subframe and the vehicle body to closely receive the mounting pin; and a bolt passing hole provided in the subframe to receive a fastening bolt to mount the  
20 subframe on the vehicle body extending in a direction substantially perpendicular to an axial line of the mounting pin.

25 Thus, the windshield wiper unit can be readily mounted on a prescribed part of a vehicle body simply by fitting the mounting pin which may be provided in the vehicle body into the mounting hole which may be provided in the subframe while ensuring a high dimensional and assembling precision at the same time. Furthermore, this structure offers a high mounting  
30 rigidity. Preferably, the mounting pin and the mounting hole extend laterally while the bolt passing hole may extend perpendicularly thereto.

35 Optionally, the free end of the mounting pin may be provided with a threaded portion so that its axial movement relative to the mounting hole may be restricted by threading a nut with the threaded portion



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and the mounting rigidity may be thereby increased. By interposing a grommet made of polymer material between the mounting pin and the mounting hole, some tolerance may be afforded in the dimensional accuracy between the mounting pin and the mounting hole, and vibrations from the windshield wiper unit may be isolated from the vehicle body.

To even further simplify the mounting process, a side portion of the mounting hole may be provided with a lateral opening for receiving the mounting pin sideways, the grommet providing an elastic retaining force to retain the mounting pin in the mounting hole.

According to a particularly preferred embodiment of the present invention, the mounting structure further comprises a second mounting pin which is integrally provided in one of the subframe and the vehicle body in a parallel relationship with the first mounting pin; and a second mounting hole provided in the other of the subframe and the vehicle body to closely receive the second mounting pin; one of the mounting pins being longer than the other so that the mounting pins may be fitted into associated ones of the mounting holes one following the other. In particular, if the mounting pins are disposed in a coaxial relationship, the mounting pins may be easily fitted into the mounting holes against friction by twising the subframe back and forth around the common axial line of the mounting pins, and a favorable tight fit can be accomplished without complicating the mounting process.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Now the present invention is described in terms of specific embodiments with reference to the appended drawings, in which:

Figure 1 is a perspective view showing a windshield wiper unit which is mounted on a vehicle body according to the present invention ;

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Figures 2 through 4 are front, rear and upper end views of the windshield wiper unit to which the present invention is applied;

5 Figure 5 is a perspective view showing one of the mounting pin and hole structure in enlarged scale; . .

Figure 6 is a illustrative view showing the positional relationship between the mounting pins and the mounting holes;

10 Figure 7 is an end view of the subframe showing how friction may be overcome in fitting the mounting pins into the mounting holes when mounting the windshield wiper unit on the vehicle body; and

Figures 8 through 11 are perspective views showing different embodiments of the mounting pin and hole structure according to the present invention.

15 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Figure 1 shows a mounted state of a windshield wiper unit 1 to which the present invention is applied. The wiper unit 1 is disposed between a windshield 3 of an automobile 2 and a hood 4 with a part thereof protruding into the reverse side of the windshield 3. The windshield wiper unit 1 is provided with a pair of wiper arms 5 and 6 on either side end thereof, and wiper blades 7 and 8 attached to the free ends of the respective wiper arms 5 and 6 undergo a sweeping movement back and forth across the surface of the windshield 3.

25 Figures 2 through 4 schematically illustrate the windshield wiper unit 1. This windshield wiper unit 1 is provided with a laterally elongated planar subframe 10 which is arcuate in conformity with the curved shape of the windshield 3. A recess 11 is formed in a front right part of the subframe 10, and a wiper motor 12 is mounted therein. The subframe 10 may be made of cast aluminum, stamped sheet metal, forged metal member, or  
30  
35 any other suitable material. The wiper motor 12

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consists of a motor unit 13 consisting of a DC motor, and a reduction unit 14 consisting of a gear mechanism, and an output shaft 15 of the reduction unit 14 projects through the subframe 10.

5       The subframe 10 is integrally provided with wiper pivots 18 and 19 rotatably supporting wiper shafts 16 and 17 at its either lateral end. The free ends of the wiper shafts 16 and 17 projecting forward from the subframe 10 carry the respective wiper arms 5 and 6. 10 As shown in Figure 4, the wiper shafts 16 and 17 project forward defining a slightly divergent angle  $\theta$  therebetween so that the wiper blades 7 and 8 may always contact the curved glass surface of the windshield 3 approximately at right angle.

15       The output shaft 15 of the wiper motor 12 and the wiper shaft 16 and 17 are connected with one another by way of a tandem link mechanism 20 consisting of a four-link mechanism. Specifically, a crank arm 21 integrally attached to the output shaft 15 is connected 20 to a bell crank lever 22 integrally attached to the other wiper shaft 16 via a connecting rod 23, and the bell crank lever 22 is connected to a another crank arm 24 integrally attached to the wiper shaft 17 via a connecting rod 25. In this way, as the output shaft 15 25 of the wiper motor 12 rotates, the wiper arms 5 and 6 along with the wiper blades 7 and 8 are moved back and forth across the windshield 3.

      In order to mount the windshield wiper unit 1 on a prescribed part of the vehicle body, mounting legs 26 30 and 27 are integrally formed in upper parts of either lateral ends of the subframe 10. As shown in Figure 5, free ends of the mounting legs 26 and 27 are fitted with grommets 30 and 31 each having a mounting through hole 28 or 29 and made of polymer material or rubber- 35 like material. The through holes 28 and 29 are

coaxially arranged along a lateral direction of the wiper unit 1 as shown in Figure 6.

5 Meanwhile, the vehicle body is provided with a pair of pins 34 and 35 each having a substantially same diameter as the through holes 28 and 29 at wiper mounting portions 32 and 33 of the vehicle body to be fitted into the grommets 30 and 31. As best shown in Figure 6, the pins 34 and 35 are arranged in a coaxially and laterally spaced relationship, and project in a same direction, leftwards with respect to the vehicle body in the case of the illustrated embodiment. The pin 34 which is to be fitted into one of the mounting legs 26 has a length L1 which is slightly greater than the length L2 of the pin 35 which is to be fitted into the other mounting leg 27. Therefore, it is possible to fit the through hole 28 of the mounting leg 26 onto the pin 34 at first as a locating process and then fit the other through hole 29 of the mounting leg 27 onto the corresponding pin 35. In this way, by fitting the mounting legs 26 and 27 onto the pins 33 and 34, one after the other, the mounting work is extremely simplified.

Further, by arranging the through holes 28 and 29 of the mounting legs 26 and 27 and the pins 34 and 35 in a coaxial relationship, it becomes possible to fit the pins 34 and 35 into the through holes 38 and 39 and then twist the subframe 10 back and forth in the direction indicated by the arrow C as shown in Figure 7. Thus, the mounting legs 26 and 27 may be fitted onto the pins 34 and 35 against friction all the way to their base ends relatively easily by pushing the subframe 10 sideways while twisting it back and forth at the same time. By mounting the subframe 10 in this fashion, the rigidity of the mounting legs 26 and 27 can be ensured in all directions except for the direction of the free ends of the pins 34 and 35. The

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grommets 30 and 31 can control vibrations and contribute to elimination of plays.

5 In order to finally secure the wiper unit 1 on the vehicle body after the mounting legs 26 and 27 are fitted onto the pins 34 and 35, in lower parts of either lateral end of the subframe 10 are integrally formed fixing portions 36 and 37 which are each provided with a vertical through hole 38 or 39, and are secured to appropriate parts of the vehicle body by passing threaded bolts (not shown in the drawings) through these holes 38 and 39 in a normal manner.

10 Figures 8 through 11 illustrate modified embodiments of the mounting hole which may be used in the present invention.

15 According to the embodiment illustrated in Figure 8, the mounting leg 41 is provided with a U-shaped slot 42 which is open at its free end. The grommet 43 is also U-shaped and defines a through hole 44 extending laterally all the way therethrough. The outer circumferential surface of the grommet 43 is provided with a recess 45 which is adapted to be received in the slot 42 so that the grommet 43 may be integrally mounted on the mounting leg 41 by fitting the recessed part of the grommet 43 into the slot 42.

20 The grommet 43 is provided with a slit 46 extending along the axial line of the through hole 45 at a part thereof opposite from the recessed part thereof. The width of the slit 46 is slightly less than the outer diameter of the corresponding pin 47 fixedly secured to the vehicle body. Thus, because the pin 47 may be fitted into the through hole 44 simply by pushing the pin 47 into the slit 46 of the mounting leg 41 sideways and slightly elastically deforming the grommet 43, the mounting work of the windshield wiper unit 1 is even

25 30 35 more simplified. According to this structure, the rigidity can be ensured in all directions, vertically,

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longitudinally and laterally, as indicated by the arrows D in this drawing except for the direction of the free end of the pin 47 and the direction of the slit 46.

5        Figure 9 shows an embodiment modified from that shown in Figure 8. According to this embodiment, the pin 48 is made longer than the longitudinal length of the through hole 44, and is provided with a threaded portion 49 at its free end. After fitting the pin 48  
10        sideways into the through hole 44 in the same way as the embodiment illustrated in Figure 8, the mounting leg 41 fitted with the grommet 43 is fixedly secured by threading a nut 51 with the threaded portion 49  
15        projecting from the through hole 44 by way of a washer 50. In this case, a rigidity is obtained in the direction of the free end of the pin 48 also.

      In the embodiment illustrated in Figure 10, the mounting leg 52 is not equipped with a grommet. Specifically, a through hole 54 is passed laterally  
20        through a center of a free end portion 53 of the mounting leg 52 having a substantially cylindrical shape. The mounting leg 52 is even more securely fixed by fitting the pin 55 fixedly secured to the vehicle  
25        body and having a substantially same diameter as the through hole 54 into the through hole 54.

      Figure 11 is an embodiment modified from the embodiment illustrated in Figure 10 in a same way as the embodiment of Figure 9 is modified from that of Figure 8. In this embodiment, the pin 56 is made  
30        longer than the longitudinal length of the through hole 54, and is provided with a threaded portion 57 at its free end. The mounting leg 52 is securely fixed by threading a nut 59 with the pin 56, which is fitted into the through hole 54, by way of a washer 58.  
35        Therefore, a high rigidity can be achieved in all direction, vertically, longitudinally and laterally.

5 The present invention is in no way limited by the  
above described embodiments, but can be implemented in  
variously modified and altered modes. For instance,  
the positions and shapes of the mounting legs and the  
grommets can be freely modified to suit the particular  
needs. The pins extended laterally in the above  
described embodiment, but they may extend vertically or  
in the fore-and-aft direction. Further, the pins may  
project from the subframe, and the associated through  
10 holes may be provided in the vehicle body. The  
mounting legs may not necessary be integrally provided  
with the subframe, and a similar effect and result can  
be achieved by attaching a separate stay member  
equipped with a mounting leg to the subframe.

15 Thus, according to the above described invention,  
since the windshield wiper unit can be readily mounted  
on a prescribed part of a vehicle body by integrally  
forming mounting legs each provided with a through hole  
in a subframe incorporating a wiper motor, a link  
20 mechanism and a wiper pivot, and fitting a pin mounted  
on the vehicle body into the through hole, the  
efficiency of the mounting work is much improved, and a  
high mounting rigidity can be achieved with the result  
that a high wiping performance can achieved, and noise  
25 emission can be reduced. Furthermore, through  
improvement in the efficiency of the assembly work,  
freedom in vehicle body design can be increased.

WHAT WE CLAIM IS:

1. A mounting structure for a windshield wiper unit including a subframe for carrying a motor, a pivot  
5 shaft to rotatably support a wiper arm at its base end on said subframe, a wiper blade attached to a free end of said wiper arm, and a power transmission mechanism for converting a rotary motion of said motor to a sweeping motion of said wiper arm, said mounting  
10 structure comprising:  
a mounting pin fixedly secured to one of said subframe and a vehicle body;  
a mounting hole provided in the other of said subframe and said vehicle body to closely receive said  
15 mounting pin; and  
a bolt passing hole provided in said subframe to receive a fastening bolt to mount said subframe on said vehicle body extending in a direction substantially perpendicular to an axial line of said mounting pin.  
20
2. A mounting structure for a windshield wiper unit according to claim 1, wherein a free end of said mounting pin is provided with means for preventing axial movement of said mounting pin with respect to  
25 said mounting hole after said mounting pin is fitted into said mounting hole.
3. A mounting structure for a windshield wiper unit according to claim 1, wherein said mounting pin and  
30 said mounting hole extend laterally with respect to said vehicle body.
4. A mounting structure for a windshield wiper unit according to claim 1, wherein said mounting hole  
35 receives said mounting pin by way of a grommet made of polymer material.



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5. A mounting structure for a windshield wiper unit according to claim 4, wherein a side portion of said mounting hole as well as that of said grommet is provided with a lateral opening for receiving said mounting pin sideways, said grommet providing an elastic retaining force to retain said mounting pin in said mounting hole.
6. A mounting structure for a windshield wiper unit according to claims 5, wherein a free end of said mounting pin is provided with means for preventing axial movement of said mounting pin with respect to said mounting hole after said mounting pin is fitted into said mounting hole by way of said grommet.
7. A mounting structure for a windshield wiper unit according to claims 1, further comprising a second mounting pin which is integrally provided in one of said subframe and said vehicle body in a parallel relationship with said first mounting pin; and a second mounting hole provided in the other of said subframe and said vehicle body to closely receive said second mounting pin; one of said mounting pins being longer than the other so that said mounting pins may be fitted into associated ones of said mounting holes one following the other.
8. A mounting structure for a windshield wiper unit according to claims 7, wherein said mounting pins are disposed in a coaxial relationship.
9. A mounting structure for a windshield wiper unit, substantially as herein described with reference to, and as shown in, the accompanying drawings.